

Investigation on Glass as a source of energy: Magnetic Solar cell

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Abstract: This is a conceptual paper aimed at harnessing the properties of glass as a good source of power. The magnetic field produced by the atoms in the glass is analyzed using optical rectification. The focus point is found by dividing the glass material into a number of matrix segments. The focus point refers to the particular point where the glass has the ability to find the maximum solar light incident on it. The solar light is made to fall on a device called pyranometer, ^[3] which is used to analyze the solar irradiance for a certain period of time, before allowing it to fall on the material,. The above process takes place when the maximum power point tracking algorithm based instrument is attached to the glass ^[4]. The complete intensity and distance relationship is known using inverse square law concept. The major challenge is that the solar light must be focused on the glass with an intensity of 1 MWatt/m^2 . The focusing object must be at 500mm away from the glass. Sun is the source of light and is located at a distance of 149,600,000km, the intensity it provides is $2.585438 \text{ micro watt/m}^2$. This intensity is very low compared to the intensity required. In order to overcome this drawback, UV light is focused on the glass ^[7].

Keyword: *pyranometer ; optical rectification ; solar light incidence ; inverse square law ; solar irradiance ; intensity of light.*

I. INTRODUCTION

This conceptual paper uses principle of optical rectification. Optical rectification process is a non-linear optical process that consists of the generation of quasi-DC polarization in a non-linear medium at the passage of an intense optical beam. The only application that follows this principle of optical rectification is the generation of TERAHERTZ SIGNAL GENERATION. In this technique, laser is used as the light source and crystal is used as a non-linear optical medium. DC polarization takes place most effectively in non-linear medium and crystal being a symmetric medium helps in generation of terahertz signals (

10^{12} Hertz). The purpose of discussing this concept is to provide basic information about the optical rectification and the application related to it. With this background, this paper deals with the concept

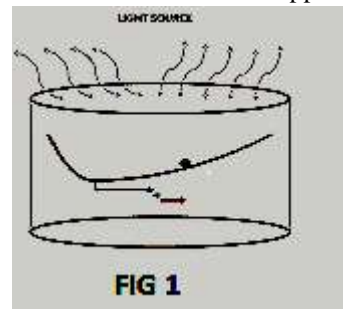
of producing DC voltage with glass as optical medium using optical rectification concept.

II. BASE IDEA EXPLANATION

This section explains the underlying principle, explanation and possible outcomes of a system. The core idea is 'that a system that has the possibility of producing the DC polarization and DC voltage from glass (normal) optical medium using visible light spectrum under optical rectification process'.

I. Principle

The underlying principle is optical rectification. Optical rectification can be explained in terms of symmetric non-linear medium, in the presence of the preferred internal direction, the polarization will not reverse its sign at the same time as the driving field. Optical rectification is analogous to the electric rectification effect produced by diodes. A diode can turn the sinusoidal electric field into DC polarization, but not DC current. If the light is intense, optical rectification causes DC current and if the light is less intense, optical rectification produces DC current in the opposite direction. e

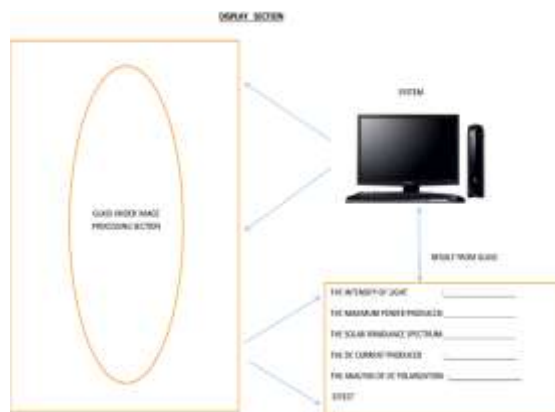


In the fig 1, the purple dot represents the electron, which is pushed side to side by a

the transmitter section in such a way that the respective information is passed to the controller section in order to adjust the telescope section to achieve the targeted intensity in the specific period of time. The telescope is used to focus the light on the non-linear optical medium. The movement of telescope is guided by the arm section, which is controlled by the controller section. The data that controls all this function is obtained from the database.

II. Display section

The parameters such as intensity of light, maximum power produced, solar irradiance spectrum, DC current level, analysis of DC polarization effect are analyzed using this section. The camera is placed at the bottom of the telescope, in such a way that it captures the image of glass that has to be monitored by the system. The image processing is carried out in a manner to have an in depth study about the changes that takes place in the glass when intense light is focused on it. The display section is shown in the following figure 5



RESEARCH ON BASE IDEA

This concept is the base idea in which the visible light component is focused on the glass for generation of DC current. This section is used for the analysis of electromagnetic spectrum of visible light spectrum, analysis of intensity of light.

I. Analysis of intensity of light

The principle behind the analysis of intensity of light is the inverse square of light. This principle is defined "the strength of light is directly proportional to the square of the distance from

source". The source as mentioned in the definition is the Sun which is about 149,500,000 km from the Earth's surface. The, the source is very far from destination and produces about 3mW/m^2 , which hardly sufficient to achieve the DC polarization from the glass.

II. Analysis of electromagnetic spectrum

According to the electromagnetic spectrum analysis, the energy of the photon in the visible light spectrum is about 3.2-4.5 electron volt practically.. Basically the glass is made up of silicon dioxide component, whose atoms are difficult to excite under normal conditions. The atoms of silicon dioxide requires about 8.9-13.3 electron volt to be excited by the incoming light. So the excitation of atoms is practically impossible by the visible light spectrum. This analysis sets the major drawback to the base idea. The pictorial representation of this analysis is shown in the figure 6.

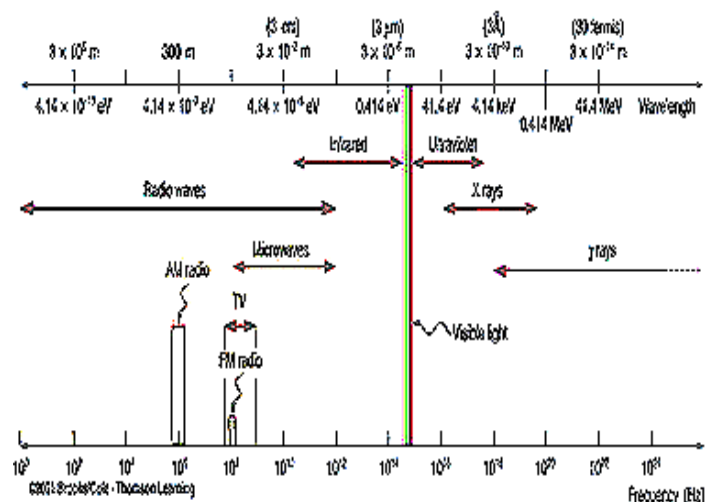


FIG 6

III. DRAWBACK

The drawback in the above technique can be discussed under two categories.

I. Electromagnetic analysis

According to electromagnetic spectrum analysis, the energy of the photon in the visible light spectrum is found to be less when compared to UV spectrum. This energy is not enough to excite the atoms in the glass, so generation of DC

current or DC polarization is very difficult on glass by visible light spectrum. The solution to this drawback is explained as the proposed solution in the following section.

II. Based on the composition of glass

Basically glass is made up of silicon dioxide material, whose atoms are tightly bounded to each other to achieve symmetrical property. The photons must require high energy to excite the atoms in the glass. The energy required to excite the atoms in the glass is 8.2-10 electron volt, which is impossible to achieve under practical conditions.

IV. SOLUTION

The solution to the above technique can be discussed under three main categories namely ultraviolet spectrum analysis, block diagram explanation, advantage over base idea.

I. Ultraviolet spectrum analysis

The ultraviolet spectrum found close to the visible light spectrum. The ultraviolet spectrum can be divided into three types namely ultraviolet A, ultraviolet B, ultraviolet C. the **wavelength related to each section are shown in the figure 7.** The purpose of the discussion about the UV light is to make sure that this solution will use the UV light spectrum for generation of DC polarization from the glass. This can be achieved from the following procedure.

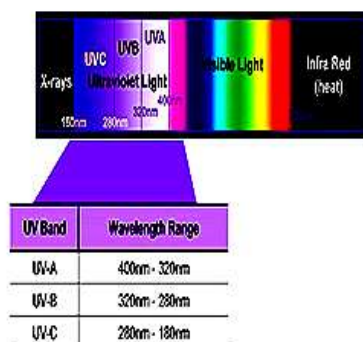


FIG 7

II. Block diagram explanation

The following figure represents the block diagram following the concept on how to use UV light for the generation of DC polarization. According to the electromagnetic analysis of light spectrum, it is evident that the UV light has the capability to emit photon of energy ranging from 13.2 – 20.12 electron volt.

The block diagram can be explained as follows:-

I. Death ray section

The main objective of this section is to improve the intensity of incoming solar light. This section includes large number of parabolic dishes whose outer covering is removed initially. This coating is filled with infinite number of small glass pieces called as array of mirrors. The purpose of array of glass mirrors is to focus the incoming light. This is designed in such a way that the light from all the mirrors are focused at a point (i.e.) the focal point of all the mirrors are same in order to bring out the complete power of light in one position for further analysis. The structure and its focusing behavior in the figure 9 and figure 10 respectively.

The figure 9 shows the parabolic dish over which the mirrors are placed sequentially to focus the light on to particular focal point.

The figure 10 shows how the light is focused at a particular point with the use of array of glass mirrors placed in parabolic dish. In order to prove the power of light at that point, it is made to focus on the wood. After a few seconds, the wood starts to burn.. The power at this point is equivalent to the power of three Sun.

There are two death ray sections are used. This set up is placed in such a way that the light from both the parabolic dishes are made to focus on the particular point in order to improve the power and intensity of incoming light.

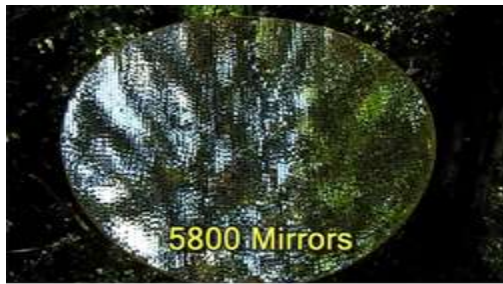


FIG 9



FIG 10

II. Plane mirror section

There are two plane mirror sections in the given block diagram in figure 8. The plane mirror is placed in the path of light that is reflected by the parabolic dish. In figure 10, assume the plane mirror section is placed between the wood and dish.

The purpose of using this section is to convert the converging light to parallel right rays. This parallel rays can be used for optical processing.

This conversion can be achieved by placing the parabolic mirror in the pathway of light from the parabolic dish. By the property of parabola, the converged light is reflected in the form of parallel rays.

The clear view of light pathway can be seen in the figure 11.

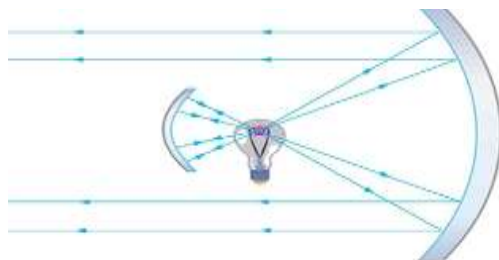


FIG 11

The above figure shows that how the light is focused on the parabolic mirror and how it is converted into parallel rays. This concept is used for converting the converged light into parallel rays for focusing them to telescope.

The telescope and pyranometer section follows the same concept as seen in the block diagram (i.e.) using the visible light spectrum as the source of light.

III. Monochromator section

The purpose of this section is to separate the ultraviolet light from the visible light spectrum of

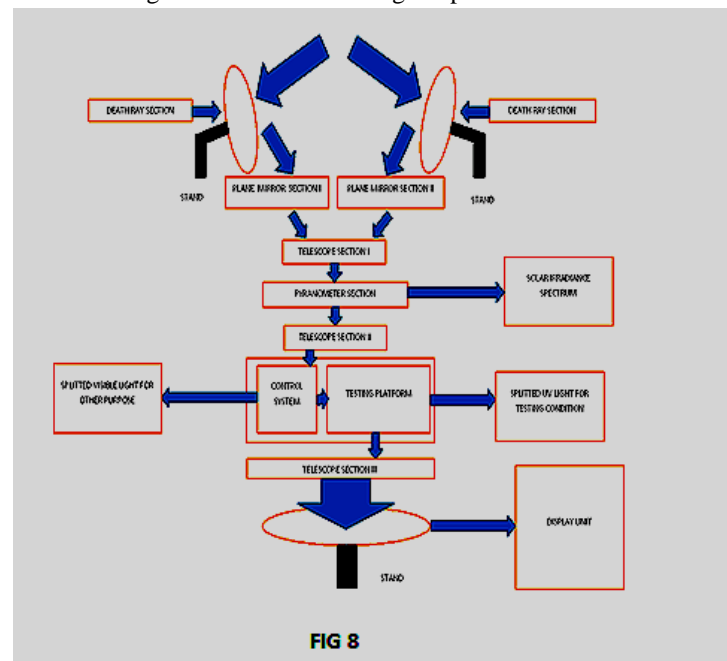
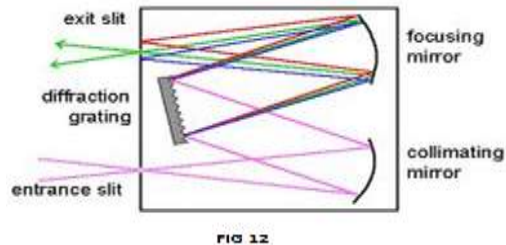


FIG 8

sun light. The aim of separating the UV light is to focus them on the glass in which the DC polarization or DC current is achieved..

The monochromator has the entrance and exit slit. The slit through which the light enters is the entrance slit. This light is made to focus on the collimated mirror. The light contains both the UV spectrum and visible light spectrum. The diffraction grating plays an important role in the separating the light into UV spectrum and visible light spectrum. The UV spectrum obtained from this section can be utilized further signal processing section. This processing section consists of a control section and pyranometer section which can analyse the presence of any spectrum content other

than UV light. After positive feedback from this section, the resultant ray can be used for focusing it on the glass. **The monochromator section can be seen as below in figure 12.**



V. FINAL OUTCOME OF THE PROPOSED IDEA

This can be discussed under three sections namely as follows

I. Achieving high intensity

The high intensity of UV light can be achieved by using telescope and its level of intensity is determined using pyranometer. These two instruments plays an important role in implementing this idea with current lab situations. The important point is that, this idea completely focuses on the UV spectrum which is dangerous to handle at high power intensity.

II. Penetration of UV light

The main aim of this project is to capture the UV light from the solar spectrum and convert them to electricity from glass used at workplace or households. Indirectly this plays an important role in preventing the UV light from penetrating the residential buildings.

III. Characteristics between the DC polarization and intensity of light

These characteristics will play an important role in achieving the optical rectification on the glass medium. This in turn will lead to the generation of DC current or DC polarization. The outcome of this project characteristics can be inferred as , that amount of DC current that can be produced from the different levels of intensity of UV light. The glass industry or any chemical industry will be of great assistance in order to manufacture glass with required characteristics. This in turn results in the production of glass with

added dopants that can produce DC current based on this characteristics.

VI. ADVANTAGE OF THE PROPOSED IDEA

The first and foremost is the utilization of solar energy as the source of power. The generation of power as of now is by using a silicon based solar panel. We propose to use glass to generate energy which open the door for a new and clean future.

VII. APPLICATION

1. This project can be implemented in Greenhouse buildings as well as an alternative for conventional electricity.
2. Based on the progress and it's natural behavior with the environment it can lead to a new concept in the generation of power to be used in agricultural fields..

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